SyncML Device Management Protocol, version 1.1.1

Abstract

This document specifies the SyncML Device Management Protocol. This protocol is used to transfer management actions between the client and the management server.

SyncML Initiative

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Revision History

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1 Introduction

This document describes a management protocol using the SyncML Representation Protocol [REPPRO]. This protocol is called the SyncML Device Management Protocol, abbreviated as SyncML DM Protocol, and it defines the protocol for various management procedures.

2 Formatting Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY" and "OPTIONAL" in this document are to be interpreted as described in "Key words for use in RFCs to Indicate Requirement Levels" [RFC 2119].

Any reference to components of the DTD's or XML snippets are specified in this `typeface`.

3 Terminology

See SyncML Representation Protocol [REPPRO] and SyncML Synchronization Protocol [SYNCPRO] for definitions of SyncML terms used within this specification.

See the DM Tree and Description document [DMTND] for definitions of terms related to the management tree.

Full device URI

Full path to a device resource specified in the device's context. It is always a URI relative to the devices' root node. Full device URI must always be used in the present specification.

Message

Atomic unit in SyncML DM Protocol protocol, one packet that the bearer network is able to accept. One SyncML DM Protocol package could be divided into many messages.

Package

Package is a conceptual set of commands that could be spread over multiple messages.

Resource

A network data object or service that can be identified by a URI, as defined in Section 3.2 of Hypertext Transfer Protocol [RFC 2616]. Resources may be available in multiple representations (e.g. multiple languages, data formats, size, and resolutions) or vary in other ways.

4 SyncML Device Management Protocol Overview

The SyncML Device Management Protocol allows management commands to be executed on nodes. It uses a package format similar to SyncML Synchronization Protocol [SYNCPRO] and SyncML Representation Protocol [REPPRO]. A node might reflect a set of configuration parameters for a device. Actions that can be taken against this node might include reading and setting parameter keys and values. Another node might be the run-time environment for software applications on a device. Actions that can be taken against this type of node might include installing, upgrading, or uninstalling software elements.

Actions are represented by SyncML Device Management Protocol Commands, which are described in SyncML Representation Protocol, Device Management Usage [DMREPU]. The commands and message structure used correspond identically to that of the [SYNCPRO]. Thus, the DTD for the Management Protocol is the DTD from [SYNCPRO].

5 Node addressing

Each node MUST be addressed by a unique full device URI. URIs MUST follow requirements specified in Uniform Resource Identifiers (URI) [RFC 2396] with the restrictions as specified in [DMTND]. All URIs are case sensitive in SyncML DM Protocol. Node addressing is defined in SyncML Device Management Tree and Descriptions [DMTND].

Each node has a type that determines what kind of management content can be set/read on that object. Operations on a certain node require a predefined type of value to be sent and when the object is read, a value of that type is returned. For example a certain node can have a simple text type (text/plain) so simple text values can be set while another node stores complex types like the WAP Provisioning document type and require that value set in that node come with the WAP Provisioning document MIME type. Examples for other objects with complex values can be WAP settings or installed software.

In SyncML DM Protocol, the target and source of a command are identified by the `Target` and `Source` elements respectively. `Target` refers to the recipient, and `Source` refers to the originator. Exceptions to this approach are mentioned in management commands requiring exception.

6 Multiple Messages In Package

6.1 Description

The SyncML Device Management protocol provides the functionality to transfer one SyncML package using multiple SyncML messages. This is necessary when one SyncML package is too large to be transferred in one SyncML message. For example, this limitation may be caused by the transport protocol or by the limitations of a small footprint device.

In SyncML Device Management, the role of the package as a logical grouping of items is very limited. Most restrictions occur on messages, not on packages. For example, a

command must fit entirely into one message. This includes the `Sequence` and `Atomic` commands, each of which must fit entirely into one message.

In order to avoid overwhelming a client with limited resources, a server is not permitted to send new commands to a client that has not yet returned a status to previous commands. In other words, most messages sent by the server to the client will correspond to a (one message) package, except in the case where a server is sending a large object or asking for more messages (using `Alert` 1222). A package containing a large object datum will span as many messages as necessary to transmit the large object, as specified in Section 7.

Note that the server is always in one of the following states with respect to package boundaries:

1. The server has sent a complete package. In this state, the server is awaiting status from the client on the commands sent in the package. Because the status and results may be large, such as the result of `Get` commands, the client may send multiple messages back to the server before completing its response.

2. The server has received a complete package (of responses) from the client. In this state, the server may send new commands to the client.

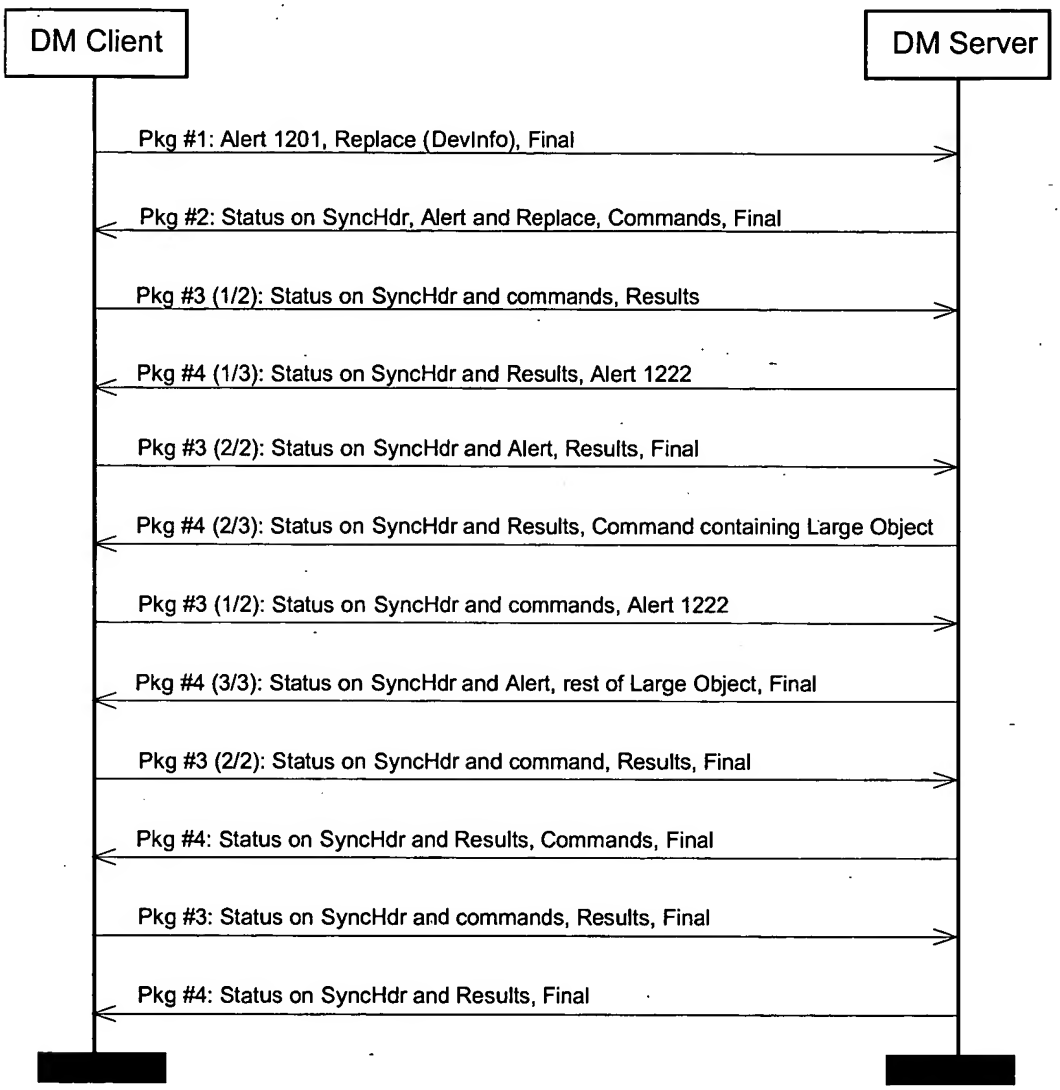
3. The server has sent one or more messages that are part of the same package, but has not yet sent the final message of the current package. This state is only valid when the server is sending a large object, and the package will end when the last chunk of the large object is sent.

Because the underlying transports for SyncML have a request/response form, either the client or the server may be required to send a message that contains neither new commands nor a `Final` flag, in order to keep the request/response cycle going.

For example, when the server is in State 1 (above), it may receive many messages from the client containing status and results. The server will respond to each such message sent by the client, but may not include new commands in those responses. Messages sent by the server in this state will contain a status to the `SyncHdr` sent by the client, statuses to commands (`Results`) sent by the client, and also the `Alert` 1222 (More Messages).

It is also possible for `Alert` 1222 to be replaced by `Alert` 1223 (Session Abort) if the server wishes to abort the session.

The following chart shows an example of how multiple messages can be used.



6.2 Requirements

If a SyncML package is transferred in multiple SyncML messages, the last message in the package MUST include the `Final` element [REPPRO]. Other messages belonging to the package MUST NOT include the `Final` element.

The `Final` element MUST NOT be supplied by the client to close its package until the server has sent its `Final` element to close the previous package. For instance, the client MUST NOT supply the `Final` element to close package #2 or package #4 until the server has supplied the `Final` element which closes the previous package (#1 or #3, respectively). This is necessary because packages #2 and #4 constitute replies to the commands in packages #1 and #3.

The recipient of a SyncML package containing multiple messages MUST be able to ask for more messages. This is done by sending an `Alert` command, with the alert code 1222, back to the sender. If there are SyncML commands to be sent as a response to a preceding message, i.e. `Results`, the `Alert` command with the 1222 alert code MAY be omitted.

In the situation in which the server has sent the `Final` flag, and the client has not yet sent its `Final` flag, the server MUST respond to the client with the following "Next Message" response:

The "Next Message" response contains `Alert` code 1222 (or 1223 to abort), status to the `SyncHdr` and to commands (`Results`), no other commands, and no `Final` flag.

A server MUST send the `Final` flag in every message, when possible. This is not possible during the sending of a Large Object (see Section 7), or when sending the "Next Message" response.

7 Large Object Handling

In SyncML DM, large objects that do not fit within one message can be transferred by splitting the object across several messages according to the Large Object Handling specified in [SYNCPRO] Section 2.10, with the restrictions specified below.

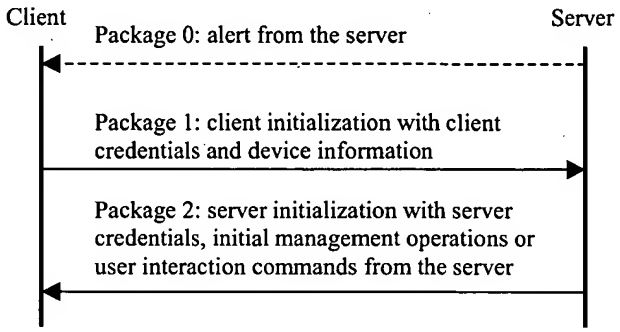
The first restriction is that clients that support Large Object Handling must indicate this by having the value of the DevDetail/LrgObj flag set to "true". The second restriction involves how the MaxObjSize is communicated between server and client (both directions). As in the Data Synchronization Protocol, MaxObjSize is communicated in Meta information. In the DM Protocol, the MaxObjSize accepted by the sender MAY be included in Meta information for the message header (SyncHdr) sent to the other party. MaxObjSize information sent in Meta information for the SyncHdr MUST be respected by the recipient, who MUST NOT send any single object larger than this size. If MaxObjSize is not sent, the recipient is free to send objects of any size back to the sender.

Note that the MaxObjSize remains in effect for the entire DM session, unless a new value is supplied in a subsequent message. A possible reason to send a new MaxObjSize in a later message in the same session might be that the MaxObjSize of a client might depend on free memory, which can decrease as objects are created and increase as objects are deleted. The MaxObjSize need not be a dynamic quantity, however.

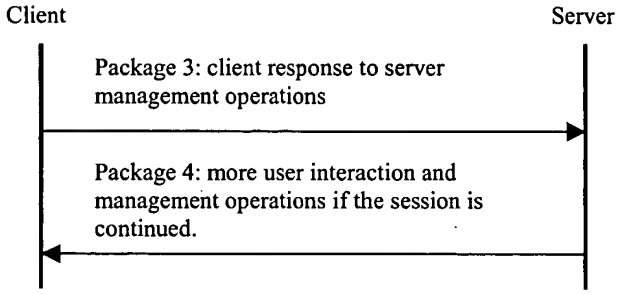
8 SyncML DM Protocol packages

SyncML DM Protocol consists of two parts: setup phase (authentication and device information exchange) and management phase. Management phase can be repeated as many times as the server wishes. Management sessions may start with Package 0 (the trigger). Trigger may be out-of-band depending on the environment and it is specified in SyncML Notification Initiated Session [DMNOTI].

The following chart depicts the two phases.



Setup phase



Management phase

The Management Phase consists of a number of protocol iterations[1]. The content of the package sent from the server to the client determines whether the session must be continued or not. If the server sends management operations in a package that need responses (`Status` or `Results`) from the client, the management phase of the protocol continues with a new package from client to server containing the client's responses to those management operations. The response package from client starts a new protocol iteration. The server can send a new management operation package and therefore initiate a new protocol iteration as many times as it wishes.

When a package from server to client does not contain management operations, the client will create a package containing only `Status` for `SyncHdr` as a response to the package received from server. In this case the entire response package MUST NOT be sent and the protocol ends. A server MUST send response packages to all client packages.

Processing of packages can consume unpredictable amount of time. Therefore the SyncML DM Protocol does not specify any timeouts between packages.

If not otherwise stated by management commands, the client and server may freely choose the execution order of the management commands sent in the package. However, when execution order is required by the parent management command, commands MUST be executed in the order they were sent.

[1] Protocol iteration means a package from client to server and a package from server to client.

Client MUST NOT send any commands other than `Replace` command containing DevInfo, `Results` and `Alert` to the server.

8.1 Session Abort

8.1.1 Description

Either the client or the server may decide to abort the session at any time. Reasons for session abort may be server shutdown, client power-down, user interaction on the client, etc. In this case it is best if the aborting party sends a SESSION ABORT `Alert`. It is recommended that the message also include `Status` and `Results` of all the management commands that the aborting party executed before the abort operation.

If a recipient of a Session Abort sends a response to this message, the response is ignored.

Some cases of session aborts are not controllable, for example if the client goes out of coverage or its battery runs down. Servers and clients must be prepared for non-signalled session aborts as well. The requirements stated above are intended to reduce situations in which one party times out on a response from the other.

Implementations are possible (e.g. OBEX) in which the request/response roles of the transport binding may be reversed, i.e. the SyncML Client is a transport-level server, and the SyncML Server is a transport-level client. In this case, the recommendation in Section 8.1.1 above may not apply.

8.1.2 Requirement

`Alert` 1223 is used to signal an unexpected end to the device management session. The sender of the Session Abort alert MAY also include `Status` and `Results` of all the management commands that the aborting party executed before the abort operation. A server receiving this alert SHOULD respond with a message that MUST contain status for the `Alert` and the `SyncHdr` and no new commands.

A client receiving `Alert` 1223 SHOULD NOT respond.

8.2 Package 0: Management Initiation Alert from server to client

Many devices cannot continuously listen for connections from a management server. Other devices simply do not wish to "open a port" (i.e. accept connections) for security reasons. However, most devices can receive unsolicited messages, sometimes called "notifications".

A management server can use this notification capability to cause the client to initiate a connection back to the management server. SyncML DM Protocol 1.1.1 specifies several Management Initiation notification bearers. Definition of bearers and notification content can be found from [DMNOTI] specification.

Note that an identical effect to receiving a Management Initiation notification can be caused in other ways. For example, the user interface (UI) of the device may allow the user to tell the client to initiate a management session. Alternatively, the management client might initiate a session as the result of a timer expiring. A fault of some type in the device could also cause the management client to initiate a session.

8.3 Package 1: Initialization from client to server

The setup phase is virtually identical to that described in the [SYNCPRO], Section 4. The purpose of the initialization package sent by the client is:

- To send the device information (like manufacturer, model etc) to a Device Management Server as specified [DMSTDOBJ]. Client MUST send device information in the first message of management session.
- To identify the client to the server according to the rules specified in Section 9.
- To inform the server whether the management session was initiated by the server (by sending a trigger in Package 0) or by the client (like end user selecting a menu item).

The detailed requirements for the initialization package from the client to server (Package 1) are:

1. The requirements for the elements within the `SyncHdr` element.
   - The value of the `VerDTD` element MUST be '1.1'.
   - The value of the `VerProto` element MUST be 'DM/1.1'.
   - `SessionID` MUST be included to indicate the ID of the management session. If the client is responding to notification, with alert code SERVER-INITIATED MGMT (1200), then `SessionID` MUST be same as in notification. Otherwise, the client generates a `SessionID` which should be unique for that client. The same `SessionID` MUST be used throughout the whole session.
   - `MsgID` MUST be used to unambiguously identify the message belonging to the management session from server to client.
   - The `Target` element MUST be used to identify the target server.
   - The `Source` element MUST be used to identify the source device.
   - The `Cred` element MAY be included in the authentication message from the Device Management client to Device Management server as specified in Section 9.
2. `Alert` MUST be sent whether the client or the server initiated the management session in the `SyncBody`. The requirement for the `Alert` command follows:
   - `CmdID` is REQUIRED
   - The `Data` element is used to carry the management session type which can be either SERVER-INITIATED MGMT (1200) or CLIENT-INITIATED MGMT (1201)

3. The device information MUST be sent using the `Replace` command in the `SyncBody`. The requirement for the `Replace` command follows:

   - `CmdID` is REQUIRED.
   - An Item element per node found from device information tree. Possible nodes in device information tree are specified in [DMSTDOBJ].
   - The `Source` element in the `Item` element MUST have a value indicating URI of node.
   - The `Data` element is used to carry the device information data.

The `Final` element MUST be used in the `SyncBody` for the message, which is the last in this package.

8.4 Package 2: Initialization from server to client

The purpose of the initialization package sent by the server is to:

- Identify the server to the client according to the rules specified in Section 9.
- Optionally, the server can send user interaction commands.
- Optionally to send management data and commands.

Package 2 MAY close the management session.

The detailed requirements for package 2 are:

1. The requirements for the elements within the `SyncHdr` element.

   - The value of the `VerDTD` element MUST be '1.1'.
   - The value of the `VerProto` element MUST be 'DM/1.1' when complying with this specification.
   - `SessionID` MUST be included to indicate the ID of the management session.
   - `MsgID` MUST be used to unambiguously identify the message belonging to the management session from server to client.
   - The `Target` element MUST be used to identify the target device.
   - The `Source` element MUST be used to identify the source device.
   - `Cred` element MAY be included in the authentication message according to the rules described in Section 9. Server is always authenticated to the device but this authentication MAY be accomplished at the transport level.

2. The `Status` MUST be returned in the `SyncBody` for the `SyncHdr` and `Alert` command sent by the client.

3. Any management operation including user interaction in the SyncML document (e.g. `Alert`, `Sequence`, `Replace`) are placed into the `SyncBody`.

   - `CmdID` is REQUIRED.
   - `Source` MUST be used if URI is needed to further address the source dataset.
   - `Target` MUST be used if URI is needed to further address the target dataset.
   - The `Data` element inside `Item` is used to include the data itself unless the command does not require a `Data` element.
   - The `Meta` element inside an operation or inside an `Item` MUST be used when the `Type` or `Format` are not the default values.

4. The `Final` element MUST be used in the `SyncBody` for the message, which is the last in this package.

8.5 Package 3: Client response sent to server

The content of package 3 is:

- Results of management actions sent from server to client
- Results of user interaction commands

This package is sent by the client if Package 2 contained management commands that required a response from the client.

The detailed requirements for package 3 are:

1. The requirements for the elements within the `SyncHdr` element.

   - The value of the `VerDTD` element MUST be '1.1'.
   - The value of the `VerProto` element MUST be 'DM/1.1'.
   - `SessionID` MUST be included to indicate the ID of the management session.
   - `MsgID` MUST be used to unambiguously identify the message belonging to the management session from server to client.
   - The `Target` element MUST be used to identify the target device.
   - The `Source` element MUST be used to identify the source device.

- A `Status` MUST be returned to indicate whether the authentication of device management server was successful or not. The `CmdRef` used in this `Status` element MUST be `SyncHdr`.

2. `Status` MUST be returned for the `SyncHdr` and `Alert` command sent by the device management server in the `SyncBody`.

3. `Status` MUST be returned in the `SyncBody` for management operations sent by the server in Package 2.

4. `Results` MUST be returned in the `SyncBody` for successful `Get` operations sent by the server in the previous package and the following requirements apply:

   - `Results` MUST contain `Meta` element with `Type` and `Format` elements describing content of `Data` element, unless the `Type` and `Format` have the default values.

   - Items in Results MUST contain the `Source` element that specifies the source URI.

The `Final` element MUST be used in the `SyncBody` for the message, which is the last in this package.

8.6 Package 4: Further server management operations

Package 4 is used to close the management session. If the server sends any operation in Package 4 that needs response from the client, the protocol restarts from Package 3 with a new protocol iteration.

The detailed requirements for package 4 are:

1. The requirements for the elements within the `SyncHdr` element.

   - The value of the `VerDTD` element MUST be '1.1'.

   - The value of the `VerProto` element MUST be 'DM/1.1'.

   - `SessionID` MUST be included to indicate the ID of the management session.

   - `MsgID` MUST be used to unambiguously identify the message belonging to the management session from server to client.

   - The `Target` element MUST be used to identify the target device.

   - The `Source` element MUST be used to identify the source device.

2. `Status` MUST be returned for the `SyncHdr` sent by the device management server in the `SyncBody`.

3. Any management operation including user interaction in the SyncML document (e.g. `Alert`, `Sequence`, `Replace`) placed into the `SyncBody`.

- `CmdID` is REQUIRED.
- `Source` MUST be used if URI is needed to further address the source dataset.
- `Target` MUST be used if URI is needed to further address the target dataset.
- The `Data` element inside `Item` is used to include the data itself unless the command does not require a `Data` element.
- The `Meta` element inside an operation or inside an `Item` MUST be used when the `Type` or `Format` are not the default values.

The `Final` element MUST be used in the `SyncBody` for the message, which is the last in this package.

9 Authentication

SyncML DM Protocol uses the SyncML authentication framework, with extensions defined in SyncML Device Management Security [DMSEC]. This section specifies the rules how the SyncML-level and the transport-level authentication are used.

Both SyncML DM Protocol client and server MUST be authenticated to each other. Authentication can be performed at different levels, however. If the transport level has built-in authentication mechanism then SyncML DM Protocol-level authentication MAY NOT be used. If the transport level does not have sufficiently strong authentication feature, SyncML DM Protocol-level authentication MUST be used. Server and client can both challenge each other if no credentials were given in the original request or the credentials were considered too weak.

It is assumed that SyncML DM Protocol will often be used on top of a transport protocol that offers session-level authentication so that authentication credentials are exchanged only at the beginning of the session (like in TLS or WTLS). If the transport level is not able to provide session authentication, however, each request MUST be authenticated.

The preferred authentication type of the server may be indicated to the client using the DMAcc/x/AuthPref parameter [DMSTDOBJ].

Generation and maintenance of client and server credentials are out of scope of the SyncML DM Protocol specification.

10 User interaction commands

10.1 Introduction

The SyncML Device Management Protocol specifies following user interaction types for example to notify and obtain confirmation from the user regarding the management operation. These interaction types are the following:

- User displayable notification associated with a certain action.
- Confirmation from the user to execute a certain management operation.
- Prompt user to provide input for upcoming management operation.
- Prompt user to select item or items among items.
- Display progress notification for a certain action.

10.2 User interaction alert types

These `Alert`'s can be sent only from the server to the client. If sent by the client, they are ignored by the server. Multiple user interaction `Alert`'s can be present in Package 2, in this case the client executes them by arbitrary order (unless `Sequence` is used) and sends back the results in multiple `Status` packages in Package 3. If the protocol continues after Package 4, Package 4 can also contain user interaction `Alert`'s.

When a user interaction is executed, server is notified about the outcome of the interaction in a `Status` message. The user interaction-specific `Status` responses are described in [DMREPU].

All user interaction `Alert`'s contain two or more `Item` elements. Client MUST preserve the order of these `Item` elements. Client MUST also process these `Item` elements in the same order as they are in the message.

User interactions, except display, SHOULD have user option to cancel operation. If the user decides to cancel the operation, then management message processing is stopped. Status codes for executed commands are reported normally and status code `(215) Not executed` is returned to all commands which are not processed. After processing the user response the server might decide to continue protocol with some other management operation.

If the UI allows the user to cancel (for any of the UI `Alerts`), then the status `(214) Operation cancelled` should be returned for the `Alert`.

10.2.1 Display

The SyncML DISPLAY `Alert` is slightly changed in SyncML DM Protocol. The `Alert` has two Items.

- The first `Item` contains optional parameters as specified in Section 10.3.
- The second `Item` has exactly one `Data` element containing the text to be displayed to the user.

Example:

```
<Alert>
  <CmdID>2</CmdID>
  <Data>1100</Data>
  <Item><Data>MINDT=10</Data></Item>
  <Item>
    <Data>Management in progress</Data>
  </Item>
</Alert>
```

10.2.2 Confirmation

Confirmation is a binary decision: the user either approves or rejects the option. A new `Alert` type is introduced for this purpose, the CONFIRM_OR_REJECT. When the client receives this `Alert`, it displays the `Alert` text then enables the user to select "Yes" or "No". If the answer is "Yes", the processing of the package continues without change in processing. If the UI allows the user to cancel, status `(214)` should be returned for the `Alert`.

If user answers "No", then package processing will change according to placement of confirmation `Alert` in package as follows.

- If confirmation `Alert` is inside `Atomic`, then `Atomic` fails and all executed commands have to be rolled back.
- If confirmation `Alert` is inside `Sequence`, then commands in `Sequence` after confirmation `Alert` are bypassed.
- If confirmation `Alert` is not inside `Atomic` or `Sequence` i.e. it's directly in `SyncBody`, then user response has no effect to package processing. In this way server can query user opinion before sending actual management commands to client device.

Status code `(215) Not Executed` will be sent back for the commands whose execution was bypassed as result of user interaction.

The `Alert` contains two `Item`'s.

- The first `Item` contains the optional parameters as specified in Section 10.3.
- The second `Item` has exactly one `Data` element containing the text to be displayed to the user.

Example:

```
<Alert>
  <CmdID>2</CmdID>
  <Data>1101</Data>
  <Item></Item> <!-- no optional parameters -->
  <Item>
    <Data>Do you want to add the CNN access point?</Data>
```

```
  </Item>
</Alert>
```

Result if user responds "No":

```
<Status>
  <CmdID>2</CmdID>
  <MsgRef>1</MsgRef>
  <CmdRef>2</CmdRef>
  <Cmd>Alert</Cmd>
  <Data>304</Data> <!-- Not modified -->
</Status>
```

If the result in the above example had been that the user chose Yes, the status would have been `(200)`.

10.2.3 User input

When this `Alert` is sent, the client displays the text then allows the user to type in a text string. This text string is then sent back to the server in a `Status` message.

The server instructs the client to execute this user interaction by sending a TEXT INPUT `Alert`. The `Alert` contains at least two `Item`'s.

- The first `Item` contains optional parameters as specified in Section 10.3.
- The second `Item` has exactly one `Data` element containing the text to be displayed to the user.

Example:

```
<Alert>
  <CmdID>2</CmdID>
  <Data>1102</Data>
  <Item></Item>
  <Item>
    <Data>Type in the name of the service you would like to
configure</Data>
  </Item>
</Alert>
```

The user is presented with the text and an input box to type in the message. The following `Status` message is sent back in the next message from client to server:

```
<Status>
  <MsgRef>1</MsgRef>
  <CmdRef>2</CmdRef>
  <Cmd>Alert</Cmd>
  <Data>200</Data> <!-- Successful, user typed in a text -->
  <Item>
    <Data>CNN</Data> <!-- User input -->
  </Item>
</Status>
```

10.2.4 User choice

When this `Alert` is sent, the user is presented with a set of possible choices. The `Alert` body MUST contain the following `Item`'s.

- The first `Item` contains optional parameters as specified in Section 10.3.
- The second `Item` has exactly one `Data` element containing the title of the selection as plain text.
- From third `Item` onwards the Item contains exactly one `Data` element that describes one possible choice as plain text. These `Item`'s are referenced by a number starting from 1. `Item`'s MUST be numbered in the order they were sent. `Item`'s SHOULD be presented to the user in the order they were sent.

The user selection is returned in `Status` message. The selected item is returned in an `Item`. The `Data` element of this `Item` contains the reference number of item. A variation of this `Alert` allows the user to select multiple items. In this case selected items are sent back in multiple `Item`'s in the same way as one selected item.

One possible implementation could be a list and each `Data` member of the `Alert` could be displayed as a row in the list. The user could select a list item then he or she would push the "Ok" button and the ID of the selected list item is sent back in a `Status` message.

Example for a single-choice `Alert`:

```
<Alert>
  <CmdID>2</CmdID>
  <Data>1103</Data>
  <Item><Data>MDT=10</Data></Item>
  <Item>
    <Data>Select service to configure</Data>
  </Item>
  <Item>
    <Data>CNN</Data>
  </Item>
  <Item>
    <Data>Mobilbank</Data>
  </Item>
  <Item>
    <Data>Game Channel</Data>
  </Item>
</Alert>
```

Response to this `Alert` returns the selected item.

```
<Status>
  <MsgRef>1</MsgRef>
  <CmdRef>2</CmdRef>
  <Cmd>Alert</Cmd>
```

```
    <Data>200</Data> <!-- Successful, user selected an item -->
    <Item>
      <Data>2</Data> <!-- User selected MobilBank -->
    </Item>
</Status>
```

Example to multiple-choice `Alert`

```
<Alert>
    <CmdID>2</CmdID>
    <Data>1104</Data>
    <Item></Item>
    <Item><Data>Select service to configure</Data></Item>
    <Item>
      <Data>CNN</Data>
    </Item>
    <Item>
      <Data>Mobilbank</Data>
    </Item>
    <Item>
      <Data>Game Channel</Data>
    </Item>
</Alert>
```

Response to this `Alert` returns the selected item. The number of the selected items can be returned in arbitrary order by the client.

```
<Status>
    <MsgRef>1</MsgRef>
    <CmdRef>2</CmdRef>
    <Cmd>Alert</Cmd>
    <Data>200</Data> <!-Successful, user selected an item -->
    <Item>
      <Data>3</Data>
    </Item>
    <Item>
      <Data>2</Data> <!-User selected Mobilbank and Game Channel -->
    </Item>
</Status>
```

10.2.5 Progress notification (object download)

User SHOULD be able to track the progress of a longer management operation like a file or object download. SyncML Device Management Protocol will not provide a separate mechanism for progress notification but it will entirely reuse the SyncML `Size` Meta-Information tag defined in SyncML Meta-Information DTD [METINF] and will make a recommendation for device manufacturers to use this tag for displaying progress notification.

According to SyncML Meta-Information DTD, any `Item` can be tagged by `Size` meta-information that determines the size of the object. When the device encounters a `Size`

meta-information tag in a received `Item`, it MAY display a progress notification on the user interface if the device decides that the item with the given size will take a longer time to download. The progress notification bar is scaled according to the length information conveyed in the `Size` element. If the size information is not sent by the server, the client is not able to display a scaled progress bar so it is recommended that servers send this information if the object to be downloaded by the client is reasonably large.

Example of an antivirus data file download with `Size` Meta Information.

```
<Add>
  <CmdID>2</CmdID>
  <Meta>
    <Format xmlns="syncml:metinf">b64</Format>
    <Type xmlns="syncml:metinf">
      application/antivirus-inc.virusdef
    </Type>
  </Meta>
  <Item>
    <Meta>
      <!-Size of the data item to download -->
      <Size xmlns='syncml:metinf'>37214</Size>
    </Meta>
    <Target><LocURI>./antivirus_data</LocURI></Target>
    <Data>
      <!-Base64-coded antivirus file -->
    </Data>
  </Item>
</Add>
```

Progress indicator will be displayed during the execution of the `Add` command and it will be scaled so that the total length of data to be downloaded is supposed to be 37214 bytes.

10.3 User interaction options

`Alert`'s MAY have optional User interaction parameters in the first `Item`. Optional parameters are represented as one text string inside the `Data` element. If the User interaction `Alert` does not have optional parameters, the first `Item` is empty. The optional parameter string conforms to the URL encoding format specified in [RFC 2396].

The following example uses two optional parameters:

```
MAXDT=30&DR=1
```

The client MUST skip without error message all the optional parameters that it is not able to process.

For the moment following optional parameters are defined.

10.3.1 MINDT (Minimum Display Time)

This parameter is a hint to the user agent, what is the minimum time that the user interaction should be displayed to the user. This can be important to guarantee that a notification message is readable.

MINDT parameter MUST have a value that can be evaluated as a positive, integer number. Value of MINDT is interpreted as notification display time to user in seconds.

Example:

```
<!-- Display this message for at least 10 seconds -->
<Item><Data>MINDT=10</Data></Item>
```

10.3.2 MAXDT (Maximum Display Time)

This parameter is a hint for the client, how long the client should wait for the user to execute the user interaction. If the user does not act within MAXDT time, the action is considered to be cancelled and a timeout status package or default response package is sent back to the server.

MAXDT parameter MUST have a value that can be evaluated as a positive, integer number. Value of MAXDT is interpreted as seconds to wait for user action.

Example:

```
<!-- Wait maximum 20 seconds for the user -->
<Item><Data>MAXDT=20</Data></Item>
```

10.3.3 DR (Default Response)

DR optional parameter specifies the initial state of the user interaction control widget. Other than setting the initial state of the user interaction control widget, DR has no other influence on the user interaction control widget. Interpretation for different user interaction types is the following:

- If the user interaction is Notification, this optional parameter is ignored.
- If the user interaction is a confirmation, 0 means that the reject user interface element is highlighted by default, 1 means that the accept user interface element is highlighted by default. Highlighted user interface element means that the "default" user interaction (like pressing Enter button) will select the highlighted user interface element. If the client user interface has no notion of highlighted user interface element, this parameter MAY be ignored.
- If the user interaction is user input, DR value specifies the original text in the text input user interface element. This text MUST conform to the optional parameter syntax rules.
- If the user interaction is single-choice, the DR value is the originally highlighted choice item. item e.g. value between 1 and the number of items in the selection list.

- If the user interaction is a multi-choice, the DR value is a minus sign-separated list of originally highlighted values (for example: 2-3).

Examples:

```
<!-- Accept by default in a Confirmation action -->
<Item><Data>DR=1</Data></Item>
```

```
<!-- Default user entry of "John Doe" in an user input action -->
<Item><Data>DR=John+Doe</Data></Item>
```

```
<!-- Default selection of item 3 in a single-choice action -->
<Item><Data>DR=3</Data></Item>
```

```
<!-- Default selection of item 2 and 3 in a multi-choice action -->
<Item><Data>DR=2-3</Data></Item>
```

10.3.4 MAXLEN (Maximum length of user input)

MAXLEN value is evaluated to a positive integer and determines the maximum number of characters that can be typed into the text input user interaction widget. The optional parameter MUST be ignored in all other kind of user interaction widget. If the specified maximum length of input string exceeds the capability of the client, the client MAY ignore the parameter.

Example:

```
<!-- Maximum string length is 30 -->
<Item><Data>MAXLEN=30</Data></Item>
```

10.3.5 IT (Input Type)

IT specifies what kind of characters are allowed in the text input user interaction widget. Based on this information a client with limited keyboard MAY display user interaction elements that allow easy input of characters not present on the keyboard. The optional parameter MUST be ignored in user interaction widgets other than text input. Allowed values:

IT=A - Alphanumeric input, client SHOULD allow input of all alphanumeric characters. This is the default behaviour.

IT=N - Numeric input, client SHOULD allow input of all numeric characters, decimal point and sign character.

IT=D - Date input, client SHOULD allow input of all numeric characters. User input is delivered to server in following text string format "DDMMYYYY", where;

- DD is day with possible leading zero.
- MM is month with possible leading zero
- YYYY is year presented with four digits

IT=T - Time input, client SHOULD allow input of all numeric characters. User input is delivered to server in following text string format "hhmmss", where;

- hh is hours with possible leading zero.
- mm is minutes with possible leading zero.
- ss is seconds with possible leading zero.

IT=P - Phone number input, client SHOULD allow input of all numeric characters, "+", "p", "w" and "s". "+" MUST be first if present in phone number.

IT=I - IP address input, client SHOULD allow input of all numeric characters. User input is delivered to server in following text string format "xxx.yyy.zzz.www"

Example:

```
<!-- Numeric text input -->
<Item><Data>IT=N</Data></Item>
```

`Status` message delivered to server as response

```
<Status>
  <MsgRef>1</MsgRef>
  <CmdRef>2</CmdRef>
  <Cmd>Alert</Cmd>
  <Data>200</Data><!-- Successful, entered a number -->
  <Item>
    <Data>-1.23</Data>
  </Item>
</Status>
```

10.3.6 ET (Echo Type)

ET specifies how text input user interaction widget echoes the characters that the user types in. The optional parameter MUST be ignored in user interaction widgets other than text input. Allowed values:

ET=T - Text input. The client SHOULD allow the user to see the character the user typed into the text input user interaction widget. This is the default behaviour.

ET=P - Password input. The client SHOULD hide the character the user typed into the text input user interaction widget. One way of doing it MAY be writing an asterisk instead of the character itself.

Example:

```
<!-- Numeric text input -->
<Item><Data>ET=T</Data></Item>
```

11 Static conformance requirements

Conformance requirements for SyncML Device Management Protocol are defined in SyncML Device Management Conformance Requirements [DMCONF].

12 References

[RFC 2616] Hypertext Transfer Protocol -- HTTP/1.1, IETF.

[RFC 2119] Key words for use in RFCs to Indicate Requirement Levels, IETF.

[RFC 2396] Uniform Resource Identifiers (URI): Generic Syntax, IETF.

[REPPRO] SyncML Representation Protocol, version 1.1.1, SyncML.

[SYNCPRO] SyncML Synchronization Protocol, version 1.1.1, SyncML.

[METINF] SyncML Meta-Information DTD, version 1.1.1, SyncML.

[DMREPU] SyncML Representation Protocol, Device Management Usage, version 1.1.1, SyncML.

[DMNOTI] SyncML Notification Initiated Session, version 1.1.1, SyncML.

[DMTND] SyncML Device Management Tree and Descriptions, version 1.1.1, SyncML.

[DMSTDOBJ] SyncML Device Management Standardised Objects, version 1.1.1, SyncML.

[DMCONF] SyncML Device Management Conformance Requirements, version 1.1.1, SyncML.

[DMSEC] SyncML Device Management Security, version 1.1.1, SyncML.

13 Appendices

13.1 Protocol Values

VerProto Codes	Description
DM/1.1	Indicates that this SyncML message uses the SyncML Device Management Protocol defined by the SyncML Initiative.

14 Protocol examples

In this section several protocol scenarios will be demonstrated.

14.1 One-step protocol initiated by the server

In this section an example is presented when a WAP connectivity context is added to the WAP settings. The user is asked a confirmation whether the settings could be added.

14.1.1 Package 1: Initialization from client to server

```
<SyncML xmlns='SYNCML:SYNCML1.1'>
  <SyncHdr>
    <VerDTD>1.1</VerDTD>
    <VerProto>DM/1.1</VerProto>
    <SessionID>1</SessionID>
    <MsgID>1</MsgID>
    <Target>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Target>
    <Source>
      <LocURI>IMEI:493005100592800</LocURI>
    </Source>
    <Cred> <!-- Client credentials are mandatory if the transport layer is
    not providing authentication.-->
      <Meta>
        <Type xmlns="syncml:metinf">syncml:auth-basic</Type>
        <Format xmlns='syncml:metinf'>b64</Format>
      </Meta>
      <Data>
        <!—base64 formatting of userid:password -->
      </Data>
    </Cred>
    <Meta> <!-- Maximum message size for the client -->
      <MaxMsgSize xmlns="syncml:metinf">5000</MaxMsgSize>
    </Meta>
  </SyncHdr>
  <SyncBody>
    <Alert>
      <CmdID>1</CmdID>
      <Data>1200</Data> <!-- Server-initiated session -->
    </Alert>
    <Replace>
      <CmdID>3</CmdID>
      <Item>
        <Source><LocURI>./DevInfo/DevId</LocURI></Source>
        <Meta>
          <Format xmlns='syncml:metinf'>chr</Format>
          <Type xmlns='syncml:metinf'>text/plain</Type>
        </Meta>
        <Data>493005100592800</Data>
      </Item>
      <Item>
        <Source><LocURI>./DevInfo/Man</LocURI></Source>
        <Meta>
          <Format xmlns='syncml:metinf'>chr</Format>
```

```
            <Type xmlns='syncml:metinf'>text/plain</Type>
          </Meta>
          <Data>Device Factory, Inc.</Data>
        </Item>
        <Item>
          <Source><LocURI>./DevInfo/Mod</LocURI></Source>
          <Meta>
            <Format xmlns='syncml:metinf'>chr</Format>
            <Type xmlns='syncml:metinf'>text/plain</Type>
          </Meta>
          <Data>SmartPhone2000</Data>
        </Item>
        <Item>
          <Source><LocURI>./DevInfo/DmV</LocURI></Source>
          <Meta>
            <Format xmlns='syncml:metinf'>chr</Format>
            <Type xmlns='syncml:metinf'>text/plain</Type>
          </Meta>
          <Data>1.0.0.1</Data>
        </Item>
        <Item>
          <Source><LocURI>./DevInfo/Lang</LocURI></Source>
          <Meta>
            <Format xmlns='syncml:metinf'>chr</Format>
            <Type xmlns='syncml:metinf'>text/plain</Type>
          </Meta>
          <Data>US-en</Data>
        </Item>
      </Replace>
      <Final/>
    </SyncBody>
</SyncML>
```

14.1.2 Package 2: Initialization from server to client

```
<SyncML xmlns='SYNCML:SYNCML1.1'>
  <SyncHdr>
    <VerDTD>1.1</VerDTD>
    <VerProto>DM/1.1</VerProto>
    <SessionID>1</SessionID>
    <MsgID>1</MsgID>
    <Source>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Source>
    <Target>
      <LocURI>IMEI:493005100592800</LocURI>
    </Target>
    <Cred> <!—Server credentials -->
      <Meta>
        <Type xmlns="syncml:metinf">syncml:auth-basic</Type>
        <Format xmlns='syncml:metinf'>b64</Format>
      </Meta>
      <Data><!-- base64 formatting of userid:password --></Data>
    </Cred>
  </SyncHdr>
  <SyncBody>
    <Status>
```

```
      <MsgRef>1</MsgRef><CmdRef>0</CmdRef>
      <Cmd>SyncHdr</Cmd>
      <CmdID>6</CmdID>
      <TargetRef>http://www.syncml.org/mgmt-server</TargetRef>
      <SourceRef>IMEI: 493005100592800</SourceRef>
      <!-Authenticated for the session -->
      <Data>212</Data>
    </Status>
    <Status>
      <MsgRef>1</MsgRef><CmdRef>1</CmdRef>
      <CmdID>7</CmdID>
      <Cmd>Alert</Cmd>
      <Data>200</Data><!-OK -->
    </Status>
    <Status>
      <MsgRef>1</MsgRef><CmdRef>3</CmdRef>
      <CmdID>8</CmdID>
      <Cmd>Replace</Cmd>
      <Data>200</Data><!-- OK -->
    </Status>
    <Sequence>
      <CmdID>1</CmdID>
      <Alert>
        <CmdID>2</CmdID>
        <Data>1101</Data> <!-- User confirmation required -->
        <Item></Item>
        <Item>
          <Data>Do you want to add the CNN access point?</Data>
        </Item>
      </Alert>
      <Replace>
        <CmdID>4</CmdID>
        <Meta>
          <Format xmlns="syncml:metinf">b64</Format>
          <Type xmlns="syncml:metinf">
            application/vnd.wap.connectivity-wbxml
          </Type>
        </Meta>
        <Item>
          <!-- CNN WAP settings object in the settings -->
          <Target>
            <LocURI>./settings/wap_settings/CNN</LocURI>
          </Target>
          <Data><!-- Base64-coded WAP connectivity document --></Data>
        </Item>
      </Replace>
    </Sequence>
    <Final/>
  </SyncBody>
</SyncML>
```

14.1.3 Package 3: Client response

```
<SyncML xmlns='SYNCML:SYNCML1.1'>
  <SyncHdr>
    <VerDTD>1.1</VerDTD>
```

```
    <VerProto>DM/1.1</VerProto>
    <SessionID>1</SessionID>
    <MsgID>2</MsgID>
    <Target>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Target>
    <Source>
      <LocURI>IMEI:493005100592800</LocURI>
    </Source>
  </SyncHdr>
  <SyncBody>
    <Status>
      <MsgRef>1</MsgRef>
      <CmdID>1</CmdID>
      <CmdRef>0</CmdRef>
      <Cmd>SyncHdr</Cmd>
      <!-SyncHdr accepted -->
      <Data>212</Data>
    </Status>
    <Status>
      <MsgRef>1</MsgRef>
      <CmdID>2</CmdID>
      <CmdRef>1</CmdRef>
      <Cmd>Sequence</Cmd>
      <!-Sequence executed correctly -->
      <Data>200</Data>
    </Status>
    <Status>
      <MsgRef>1</MsgRef><CmdRef>2</CmdRef>
      <CmdID>3</CmdID>
      <Cmd>Alert</Cmd>
      <!-OK, the user confirmed the action-->
      <Data>200</Data>
    </Status>
    <Status>
      <MsgRef>1</MsgRef>
      <CmdRef>4</CmdRef>
      <CmdID>4</CmdID>
      <Cmd>Replace</Cmd>
      <TargetRef>./settings/wap_settings/CNN</TargetRef>
      <!-OK, access point added-->
      <Data>200</Data>
    </Status>
    <Final/>
  </SyncBody>
</SyncML>
```

14.1.4 Package 4: Acknowledgement of client status

This package is now empty as no actions are sent and client does not continue the protocol.

```
<SyncML xmlns='SYNCML:SYNCML1.1'>
```

```
  <SyncHdr>
    <VerDTD>1.1</VerDTD>
    <VerProto>DM/1.1</VerProto>
    <SessionID>1</SessionID>
    <MsgID>2</MsgID>
    <Source>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Source>
    <Target>
      <LocURI>IMEI:493005100592800</LocURI>
    </Target>
  </SyncHdr>
  <SyncBody>
    <Status>
      <MsgRef>2</MsgRef>
      <CmdID>1</CmdID>
      <CmdRef>0</CmdRef>
      <Cmd>SyncHdr</Cmd>
      <Data>200</Data>
    </Status>
    <Final/>
  </SyncBody>
</SyncML>
```

14.2 Two-step protocol initiated by the server

Operator initiates a regular antivirus software update on PDA clients. The server checks the installed version in the first management section then updates the antivirus data in the second step.

14.2.1 Package 1: Initialization from client to server

```
<SyncML xmlns='SYNCML:SYNCML1.1'>
  <SyncHdr>
    <VerDTD>1.1</VerDTD>
    <VerProto>DM/1.1</VerProto>
    <SessionID>1</SessionID>
    <MsgID>1</MsgID>
    <Target>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Target>
    <Source>
      <LocURI>IMEI:493005100592800</LocURI>
    </Source>
    <Cred> <!—Client credentials are optional -->
      <Meta>
        <Type xmlns="syncml:metinf">syncml:auth-basic</Type>
        <Format xmlns='syncml:metinf'>b64</Format>
      </Meta>
      <Data><!-- base64 formatting of userid:password --></Data>
    </Cred>
    <Meta><!-- Maximum message size for the client -->
      <MaxMsgSize xmlns="syncml:metinf">5000</MaxMsgSize>
    </Meta>
  </SyncHdr>
  <SyncBody>
```

```
    <Alert>
      <CmdID>1</CmdID>
      <Data>1200</Data> <!-- Server-initiated session -->
    </Alert>
    <Replace>
      <CmdID>3</CmdID>
      <Item>
        <Source><LocURI>./DevInfo/DevId</LocURI></Source>
        <Meta>
          <Format xmlns='syncml:metinf'>chr</Format>
          <Type xmlns='syncml:metinf'>text/plain</Type>
        </Meta>
        <Data>493005100592800</Data>
      </Item>
      <Item>
        <Source><LocURI>./DevInfo/Man</LocURI></Source>
        <Meta>
          <Format xmlns='syncml:metinf'>chr</Format>
          <Type xmlns='syncml:metinf'>text/plain</Type>
        </Meta>
        <Data>Device Factory, Inc.</Data>
      </Item>
      <Item>
        <Source><LocURI>./DevInfo/Mod</LocURI></Source>
        <Meta>
          <Format xmlns='syncml:metinf'>chr</Format>
          <Type xmlns='syncml:metinf'>text/plain</Type>
        </Meta>
        <Data>SmartPhone2000</Data>
      </Item>
      <Item>
        <Source><LocURI>./DevInfo/DmV</LocURI></Source>
        <Meta>
          <Format xmlns='syncml:metinf'>chr</Format>
          <Type xmlns='syncml:metinf'>text/plain</Type>
        </Meta>
        <Data>1.0.0.1</Data>
      </Item>
      <Item>
        <Source><LocURI>./DevInfo/Lang</LocURI></Source>
        <Meta>
          <Format xmlns='syncml:metinf'>chr</Format>
          <Type xmlns='syncml:metinf'>text/plain</Type>
        </Meta>
        <Data>US-en</Data>
      </Item>
    </Replace>
    <Final/>
  </SyncBody>
</SyncML>
```

14.2.2 Package 2: Initialization from server to client

```
<SyncML xmlns='SYNCML:SYNCML1.1'>
  <SyncHdr>
    <VerDTD>1.1</VerDTD>
    <VerProto>DM/1.1</VerProto>
```

```
    <SessionID>1</SessionID>
    <MsgID>1</MsgID>
    <Source>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Source>
    <Target>
      <LocURI>IMEI:493005100592800</LocURI>
    </Target>
    <Cred> <!—Server credentials -->
      <Meta>
        <Type xmlns="syncml:metinf">syncml:auth-basic</Type>
        <Format xmlns='syncml:metinf'>b64</Format>
      </Meta>
      <Data><!-- base64 formatting of userid:password --></Data>
    </Cred>
  </SyncHdr>
  <SyncBody>
    <Status>
      <MsgRef>1</MsgRef><CmdRef>0</CmdRef>
      <Cmd>SyncHdr</Cmd>
      <CmdID>5</CmdID>
      <TargetRef>http://www.syncml.org/mgmt-server</TargetRef>
      <SourceRef>IMEI: 493005100592800</SourceRef>
      <!—Authenticated for the session -->
      <Data>212</Data>
    </Status>
    <Status>
      <MsgRef>1</MsgRef><CmdRef>1</CmdRef>
      <CmdID>6</CmdID>
      <Cmd>Alert</Cmd>
      <Data>200</Data><!—OK -->
    </Status>
    <Status>
      <MsgRef>1</MsgRef><CmdRef>3</CmdRef>
      <CmdID>7</CmdID>
      <Cmd>Replace</Cmd>
      <Data>200</Data><!-- OK -->
    </Status>
    <Alert>
      <CmdID>2</CmdID>
      <Data>1100</Data> <!-- User displayable notification -->
      <Item></Item>
      <Item>
        <Data>Your antivirus software is being updated</Data>
      </Item>
    </Alert>
    <!-- Let's get the installed antivirus definition version number now -
->
    <Get>
      <CmdID>4</CmdID>
      <Item>
        <Target>
          <LocURI>./antivirus_data/version</LocURI>
        </Target>
      </Item>
    </Get>
    <Final/>
  </SyncBody>
</SyncML>
```

14.2.3 Package 3: Client response

```
<SyncML xmlns='SYNCML:SYNCML1.1'>
  <SyncHdr>
    <VerDTD>1.1</VerDTD>
    <VerProto>DM/1.1</VerProto>
    <SessionID>1</SessionID>
    <MsgID>2</MsgID>
    <Target>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Target>
    <Source>
      <LocURI>IMEI:493005100592800</LocURI>
    </Source>
  </SyncHdr>
  <SyncBody>
    <Status>
      <MsgRef>1</MsgRef>
      <CmdID>1</CmdID>
      <Cmd>SyncHdr</Cmd>
      <Data>212</Data>
    </Status>
    <Status>
      <MsgRef>1</MsgRef>
      <CmdRef>2</CmdRef>
      <CmdID>2</CmdID>
      <Cmd>Alert</Cmd>
      <Data>200</Data><!—User notification OK -->
    </Status>
    <Status>
      <MsgRef>1</MsgRef>
      <CmdRef>4</CmdRef>
      <CmdID>2</CmdID>
      <Cmd>Get</Cmd>
      <TargetRef>./antivirus_data/version</TargetRef>
      <Data>200</Data><!-- Get OK -->
    </Status>
    <!-- Results for the Get: antivirus version number -->
    <Results>
      <MsgRef>1</MsgRef><CmdRef>4</CmdRef>
      <CmdID>3</CmdID>
      <Item>
        <Source>
          <LocURI>./antivirus_data/version</LocURI>
        </Source>
        <Data>antivirus-inc/20010522b/5</Data>
      </Item>
    </Results>
    <Final/>
  </SyncBody>
</SyncML>
```

14.2.4 Package 4: Continue with management operations

```
<SyncML xmlns='SYNCML:SYNCML1.1'>
  <SyncHdr>
    <VerDTD>1.1</VerDTD>
    <VerProto>DM/1.1</VerProto>
    <SessionID>1</SessionID>
    <MsgID>2</MsgID>
    <Target>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Target>
    <Source>
      <LocURI>IMEI:493005100592800</LocURI>
    </Source>
  </SyncHdr>
  <SyncBody>
    <Status>
      <MsgRef>2</MsgRef>
      <CmdID>1</CmdID>
      <Cmd>SyncHdr</Cmd>
      <Data>212</Data>
    </Status>
    <!-- Send now antivirus updates -->
    <Replace>
      <CmdID>2</CmdID>
      <Meta>
        <Format xmlns="syncml:metinf">b64</Format>
        <Type xmlns="syncml:metinf">
          application/antivirus-inc.virusdef
        </Type>
      </Meta>
      <Item>
        <Target>
          <LocURI>./antivirus_data</LocURI>
        </Target>
        <Data><!-- Base64-coded antivirus file --></Data>
      </Item>
    </Replace>
    <Final/>
  </SyncBody>
</SyncML>
```

14.2.5 Restart protocol iteration with Package 3: Client response

```
<SyncML xmlns='SYNCML:SYNCML1.1'>
  <SyncHdr>
    <VerDTD>1.1</VerDTD>
    <VerProto>DM/1.1</VerProto>
    <SessionID>1</SessionID>
    <MsgID>3</MsgID>
    <Target>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Target>
    <Source>
      <LocURI>IMEI:493005100592800</LocURI>
    </Source>
  </SyncHdr>
  <SyncBody>
    <Status>
```

```
      <MsgRef>2</MsgRef>
      <CmdID>1</CmdID>
      <Cmd>SyncHdr</Cmd>
      <Data>200</Data>
    </Status>
    <Status>
      <MsgRef>1</MsgRef>
      <CmdRef>2</CmdRef>
      <CmdID>2</CmdID>
      <Cmd>Replace</Cmd>
      <TargetRef>./antivirus_data</TargetRef>
      <!-- OK, antivirus update loaded-->
      <Data>200</Data>
    </Status>
    <Final/>
  </SyncBody>
</SyncML>
```

14.2.6 Package 4: Finish the protocol, no continuation

```
<SyncML xmlns='SYNCML:SYNCML1.1'>
  <SyncHdr>
    <VerDTD>1.1</VerDTD>
    <VerProto>DM/1.1</VerProto>
    <SessionID>1</SessionID>
    <MsgID>3</MsgID>
    <Source>
      <LocURI>http://www.syncml.org/mgmt-server</LocURI>
    </Source>
    <Target>
      <LocURI>IMEI:493005100592800</LocURI>
    </Target>
  </SyncHdr>
  <SyncBody>
    <Status>
      <MsgRef>3</MsgRef>
      <CmdID>1</CmdID>
      <CmdRef>0</CmdRef>
      <Cmd>SyncHdr</Cmd>
      <Data>200</Data>
    </Status>
    <Final/>
  </SyncBody>
</SyncML>
```